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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
08/520,079	08/28/1995	SHUNPEI YAMAZAKI		1321

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NIXON PEABODY, LLP
8180 GREENSBORO DRIVE
SUITE 800
MCLEAN, VA 22102

EXAMINER

BROCK II, PAUL E

ART UNIT	PAPER NUMBER
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2815

DATE MAILED: 09/25/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

08/520,079

Applicant(s)

YAMAZAKI ET AL.

Examiner

Paul E Brock II

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 05 March 2002.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 73-116, 119 and 123-155 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 73-116, 119 and 123-155 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 28 August 1995 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 54.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

1. Claim 119 is objected to for depending from a canceled base claim. Claim 118 is cancelled while claim 119 depends from claim 118. For purposes of this action, claim 119 will be read as dependent from claim 74.

2. Claim 119 is objected to under 37 CFR 1.75 as being a substantial duplicate of claim 75.

When two claims in an application are duplicates or else are so close in content that they both cover the same thing, despite a slight difference in wording, it is proper after allowing one claim to object to the other as being a substantial duplicate of the allowed claim. See MPEP § 706.03(k).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 73 – 116, 119, and 123 – 155 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhang et al. (USPAT 5563426, Zhang¹).

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With regard to claim 73, Zhang¹ discloses in figure 4c a thin film transistor. Zhang¹ discloses in figures 1a – 1c, 2a – 2d, and 4a – 4c a crystalline semiconductor island (3) over a substrate (1a) having an insulating surface (1b). Zhang¹ discloses in figures 4b and 4c source (25a and 25c) and drain regions (25b and 25d) in said semiconductor island. Zhang¹ discloses in figure 4b a channel forming region (between 25a and 25b in figure 4b) between said source and drain regions. Zhang¹ discloses in figures 4a – 4c a gate insulating film (22) adjacent to at least said channel forming region. Zhang¹ discloses in figures 1a- 1c, 2a – 2d, and 4a – 4c a gate electrode (23a) adjacent to said channel forming region having said gate insulating film therebetween, wherein said channel forming region has no grain boundary (4). No differences have been pointed out in the formation of the channel forming region of Zhang¹ and the channel forming region of the current pending claim in view of the currently pending specification. Therefore Zhang¹ must teach in figures 1a – 1c, 2a – 2d and 4a – 4c wherein said semiconductor island includes a spin density not higher than $1 \times 10^{17} \text{ cm}^{-3}$, because an identical spin density is a property that must be shared by products that result from two processes that are the same. Zhang¹ discloses in figures 4c and column 11, lines 47 – 56 wherein said crystalline semiconductor island includes hydrogen at concentration less than $1 \times 10^{20} \text{ cm}^{-3}$ (i.e. the known atomic density of Si is 10^{22} cm^{-3} , less than 5% of 10^{22} is less than 10^{20}). It is not clear if Zhang¹ teaches that the hydrogen concentration is not greater than $1 \times 10^{20} \text{ cm}^{-3}$. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use the hydrogen atom concentration of not greater than $1 \times 10^{20} \text{ cm}^{-3}$ in the device of Zhang¹ because the current claimed range and the disclosed range in Zhang¹ overlap. Further, any changes in particular device concentrations or properties would have been routine

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experimentation for one of ordinary skill seeking to maximize device function in the device of Zhang¹.

With regard to claim 74, Zhang¹ discloses in figures 1a, 1b, and 2a; and column 6, lines 19 – 40 wherein the crystalline semiconductor island comprise a material of Ni.

With regard to claim 75, Zhang¹ discloses in figures 1a, 1b, and 2a; and column 6, lines 19 – 40 a thin film transistor wherein said material is included in said semiconductor island at a concentration less than $5 \times 10^{19} \text{ cm}^{-3}$. It is not clear if Zhang¹ teaches that the material is included in the semiconductor at a concentration not greater than $5 \times 10^{19} \text{ cm}^{-3}$. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use the material included in the semiconductor at a concentration not greater than $5 \times 10^{19} \text{ cm}^{-3}$ in the device of Zhang¹ because the current claimed range and the disclosed range in Zhang¹ overlap.

With regard to claim 76, Zhang¹ discloses in column 9, lines 38 – 45 a thin film transistor wherein said semiconductor island includes the point defect (oxygen) of less $1 \times 10^{18} \text{ cm}^{-3}$. It is not clear if Zhang¹ teaches wherein said semiconductor island includes a point defect of $1 \times 10^{16} \text{ cm}^{-3}$ or more. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to have said semiconductor island include a point defect of $1 \times 10^{16} \text{ cm}^{-3}$ or more in the device of Zhang¹ because the current claimed range and the disclosed range in Zhang¹ overlap. Zhang¹ teaches in column 11, lines 47 – 56 that is obvious to have the hydrogen element for neutralizing the point defect at a concentration of 1×10^{18} .

With regard to claim 77, it is obvious in Zhang¹ wherein said semiconductor island includes the spin density not lower than $1 \times 10^{15} \text{ cm}^{-3}$.

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With regard to claim 78, Zhang¹ discloses in column 4, lines 18 – 20 wherein said semiconductor island is a silicon island.

With regard to claim 79, Zhang¹ discloses in column 9, lines 38 – 43 wherein the crystalline semiconductor island includes carbon and nitrogen at a concentration less than $1 \times 10^{18} \text{ cm}^{-3}$, and oxygen at a concentration less than $1 \times 10^{18} \text{ cm}^{-3}$. It is not clear if Zhang¹ teaches that said crystalline semiconductor island includes carbon and nitrogen at a concentration not lower than $1 \times 10^{16} \text{ cm}^{-3}$, and oxygen at a concentration not lower than $1 \times 10^{17} \text{ cm}^{-3}$. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use carbon and nitrogen at a concentration not lower than $1 \times 10^{16} \text{ cm}^{-3}$, and oxygen at a concentration not lower than $1 \times 10^{17} \text{ cm}^{-3}$ in the device of Zhang¹ because the current claimed range and the disclosed range in Zhang¹ overlap.

With regard to claim 80, Zhang¹ discloses in figure 4c a thin film transistor. Zhang¹ discloses in figures 1a – 1c, 2a – 2d, and 4a – 4c a crystalline semiconductor island on an insulating surface. Zhang¹ discloses in figures 4b and 4c source and drain regions in said semiconductor island. Zhang¹ discloses in figure 4b a channel forming region between said source and drain regions. Zhang¹ discloses in figures 4a – 4c a gate insulating film on at least said channel forming region. Zhang¹ discloses in figures 1a– 1c, 2a – 2d, and 4a – 4c a gate electrode over said channel forming region having said gate insulating film therebetween, wherein said channel forming region has no grain boundary. Zhang¹ discloses in column 9, lines 38 – 45 a thin film transistor wherein said semiconductor island includes the point defect (oxygen) of less $1 \times 10^{18} \text{ cm}^{-3}$. It is not clear if Zhang¹ teaches wherein said semiconductor island includes a point defect of $1 \times 10^{16} \text{ cm}^{-3}$ or more. MPEP 2144.05 states that overlapping ranges

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are obvious. It would have been obvious to one of ordinary skill in the art to have said semiconductor island include a point defect of $1 \times 10^{16} \text{ cm}^{-3}$ or more in the device of Zhang¹ because the current claimed range and the disclosed range in Zhang¹ overlap. Zhang¹ discloses in figures 4c and column 11, lines 47 – 56 wherein said crystalline semiconductor island includes hydrogen at concentration less than $1 \times 10^{20} \text{ cm}^{-3}$ (i.e. the known atomic density of Si is 10^{22} cm^{-3} , less than 5% of 10^{22} is less than 10^{20}). It is not clear if Zhang¹ teaches that the hydrogen concentration is not higher than $1 \times 10^{20} \text{ cm}^{-3}$. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use the hydrogen atom concentration of not higher than $1 \times 10^{20} \text{ cm}^{-3}$ in the device of Zhang¹ because the current claimed range and the disclosed range in Zhang¹ overlap. Further, any changes in particular device concentrations or properties would have been routine experimentation for one of ordinary skill seeking to maximize device function in the device of Zhang¹.

With regard to claim 81, Zhang¹ discloses in figures 1a, 1b, and 2a; and column 6, lines 19 – 40 wherein the crystalline semiconductor island comprise a material of Ni.

With regard to claim 82, Zhang¹ discloses in figures 1a, 1b, and 2a; and column 6, lines 19 – 40 a thin film transistor wherein said material is included in said semiconductor island at a concentration less than $5 \times 10^{19} \text{ cm}^{-3}$. It is not clear if Zhang¹ teaches that the material is included in the semiconductor at a concentration not higher than $5 \times 10^{19} \text{ cm}^{-3}$. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use the material included in the semiconductor at a concentration not higher than $5 \times 10^{19} \text{ cm}^{-3}$ in the device of Zhang¹ because the current claimed range and the disclosed range in Zhang¹ overlap.

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With regard to claim 83, Zhang¹ discloses in figures 4c and column 11, lines 47 – 56 wherein said semiconductor island includes hydrogen for neutralizing the point defect at a concentration less than $1 \times 10^{20} \text{ cm}^{-3}$. It is not clear if Zhang¹ teaches that the hydrogen concentration is not lower than $1 \times 10^{15} \text{ cm}^{-3}$. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use the hydrogen atom concentration of not lower than $1 \times 10^{15} \text{ cm}^{-3}$ in the device of Zhang¹ because the current claimed range and the disclosed range in Zhang¹ overlap.

With regard to claim 84, No differences have been pointed out in the formation of the channel forming region of Zhang¹ and the channel forming region of the current pending claim in view of the currently pending specification. Therefore Zhang¹ must teach in figures 1a – 1c, 2a – 2d and 4a – 4c wherein said semiconductor island includes a spin density of 1×10^{15} to $1 \times 10^{17} \text{ cm}^{-3}$, because an identical spin density is a property that must be shared by products that result from two processes that are the same.

With regard to claim 85, Zhang¹ discloses in column 4, lines 18 – 20 wherein said semiconductor island is a silicon island.

With regard to claim 86, Zhang¹ discloses in column 9, lines 38 – 43 wherein the crystalline semiconductor island includes carbon and nitrogen at a concentration less than $1 \times 10^{18} \text{ cm}^{-3}$, and oxygen at a concentration less than $1 \times 10^{18} \text{ cm}^{-3}$. It is not clear if Zhang¹ teaches that said crystalline semiconductor island includes carbon and nitrogen at a concentration not lower than $1 \times 10^{16} \text{ cm}^{-3}$, and oxygen at a concentration not lower than $1 \times 10^{17} \text{ cm}^{-3}$. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use carbon and nitrogen at a concentration not lower than $1 \times 10^{16} \text{ cm}^{-3}$

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³, and oxygen at a concentration not lower than $1 \times 10^{17} \text{ cm}^{-3}$ in the device of Zhang¹ because the current claimed range and the disclosed range in Zhang¹ overlap.

With regard to claim 87, Zhang¹ discloses in figure 4c a semiconductor device. Zhang¹ discloses in figures 1a – 1c, 2a – 2d, and 4a – 4c a crystalline semiconductor island on an insulating surface. Zhang¹ discloses in figures 4b and 4c source and drain regions in said semiconductor island. Zhang¹ discloses in figure 4b a channel forming region between said source and drain regions. Zhang¹ discloses in figures 1a- 1c, 2a – 2d, and 4a – 4c a gate insulating film adjacent to at least said channel forming region. Zhang¹ discloses in figures 1a- 1c, 2a – 2d, and 4a – 4c a gate electrode adjacent to said channel forming region having said gate insulating film therebetween, wherein said crystalline semiconductor island is formed in a monodomain region which contains no grain boundary. Zhang¹ discloses in figures 4c and column 11, lines 47 – 56 wherein said crystalline semiconductor island includes hydrogen at concentration less than $1 \times 10^{20} \text{ cm}^{-3}$ (i.e. the known atomic density of Si is 10^{22} cm^{-3} , less than 5% of 10^{22} is less than 10^{20}). It is not clear if Zhang¹ teaches that the hydrogen concentration is not higher than $1 \times 10^{20} \text{ cm}^{-3}$. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use the hydrogen atom concentration of not higher than $1 \times 10^{20} \text{ cm}^{-3}$ in the device of Zhang¹ because the current claimed range and the disclosed range in Zhang¹ overlap. Zhang¹ discloses in column 9, lines 38 – 45 wherein the semiconductor device includes a p-channel thin film transistor having a mobility in a range of $20 - 100 \text{ cm}^2/\text{Vs}$. Zhang¹ is silent to the fact that the semiconductor device includes a p-channel thin film transistor having mobility in a range of $200-400 \text{ cm}^2/\text{Vs}$. Mobility is a function of the purity of the single crystal (monodomain) semiconductor. MPEP

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section 2144.04, VII teaches that it is obvious to one of ordinary skill in the art to have a more purely defect free p-channel monodomain region with mobility in a range of 200-400 cm²/Vs in the device of Zhang¹. This is because the prior art teaches a suitable method for obtaining the claimed mobility, and that fact that the monodomain region of Zhang¹ has the same utility as that of the claimed invention. Further, any changes in particular device concentrations or properties would have been routine experimentation for one of ordinary skill seeking to maximize device function in the device of Zhang¹.

With regard to claim 88, Zhang¹ discloses in figures 1a, 1b, and 2a; and column 6, lines 19 – 40 wherein said crystalline semiconductor island comprises a material Ni.

With regard to claim 89, Zhang¹ discloses in figures 1a, 1b, and 2a; and column 6, lines 19 – 40 a thin film transistor wherein said material is included in said semiconductor island at a concentration less than $5 \times 10^{19} \text{ cm}^{-3}$. It is not clear if Zhang¹ teaches that the material is included in the semiconductor at a concentration not higher than $5 \times 10^{19} \text{ cm}^{-3}$. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use the material included in the semiconductor at a concentration not higher than $5 \times 10^{19} \text{ cm}^{-3}$ in the device of Zhang¹ because the current claimed range and the disclosed range in Zhang¹ overlap.

With regard to claim 90, Zhang¹ discloses in column 4, lines 18 – 20 wherein said semiconductor island is a silicon island.

With regard to claim 91, Zhang¹ discloses in column 9, lines 38 – 43 wherein the crystalline semiconductor island includes carbon and nitrogen at a concentration less than $1 \times 10^{18} \text{ cm}^{-3}$, and oxygen at a concentration less than $1 \times 10^{18} \text{ cm}^{-3}$. It is not clear if Zhang¹ teaches

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that said crystalline semiconductor island includes carbon and nitrogen at a concentration not lower than $1 \times 10^{16} \text{ cm}^{-3}$, and oxygen at a concentration not lower than $1 \times 10^{17} \text{ cm}^{-3}$. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use carbon and nitrogen at a concentration not lower than $1 \times 10^{16} \text{ cm}^{-3}$, and oxygen at a concentration not lower than $1 \times 10^{17} \text{ cm}^{-3}$ in the device of Zhang¹ because the current claimed range and the disclosed range in Zhang¹ overlap.

With regard to claim 92, Zhang¹ teaches in figures 1a, 1b, 2a – 2d; and column 12, lines 1 – 30 wherein said monodomain region has a grain size of 50 μm or more. It should be noted that the crystal grains (3) grown around metal portions (2) must have a grain size of 50 – 100 μm when the metal portions are set from 25 – 50 μm apart as disclosed by Zhang¹ in column 12, lines 1 – 30.

With regard to claim 93, Zhang¹ discloses in figure 4c semiconductor device. Zhang¹ discloses in figures 1a – 1c, 2a – 2d, and 4a – 4c a crystalline semiconductor island on an insulating surface. Zhang¹ discloses in figures 4b and 4c source and drain regions in said semiconductor island. Zhang¹ discloses in figure 4b a channel forming region between said source and drain regions. Zhang¹ discloses in figures 1a – 1c, 2a – 2d, and 4a – 4c a gate insulating film adjacent to at least said channel forming region. Zhang¹ discloses in figures 1a – 1c, 2a – 2d, and 4a – 4c a gate electrode adjacent to said channel forming region having said gate insulating film therebetween, wherein said channel forming region is formed in a monodomain region which contains no grain boundary. Zhang¹ discloses in figures 4c and column 11, lines 47 – 56 wherein said crystalline semiconductor island includes hydrogen at concentration less than $1 \times 10^{20} \text{ cm}^{-3}$ (i.e. the known atomic density of Si is 10^{22} cm^{-3} , less than 5% of 10^{22} is less than

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10^{20}). It is not clear if Zhang¹ teaches that the hydrogen concentration is not higher than $1 \times 10^{20} \text{ cm}^{-3}$. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use the hydrogen atom concentration of not higher than $1 \times 10^{20} \text{ cm}^{-3}$ in the device of Zhang¹ because the current claimed range and the disclosed range in Zhang¹ overlap. Zhang¹ discloses in column 9, lines 38 – 45 wherein the semiconductor device includes a n-channel thin film transistor having a mobility in a range of $30 - 150 \text{ cm}^2/\text{Vs}$. Zhang¹ is silent to the fact that the semiconductor device includes an n-channel thin film transistor having mobility in a range of $500-1000 \text{ cm}^2/\text{Vs}$. Mobility is a function of the purity of the single crystal (monodomain) semiconductor. MPEP section 2144.04, VII teaches that it is obvious to one of ordinary skill in the art to have a more purely defect free n-channel monodomain region with mobility in a range of $500-1000 \text{ cm}^2/\text{Vs}$ in the device of Zhang¹. This is because the prior art teaches a suitable method for obtaining the claimed mobility, and that fact that the monodomain region of Zhang¹ has the same utility as that of the claimed invention. Further, any changes in particular device concentrations or properties would have been routine experimentation for one of ordinary skill seeking to maximize device function in the device of Zhang¹.

With regard to claim 94, Zhang¹ discloses in figures 1a, 1b, and 2a; and column 6, lines 19 – 40 wherein said crystalline semiconductor island comprises a material Ni.

With regard to claim 95, Zhang¹ discloses in figures 1a, 1b, and 2a; and column 6, lines 19 – 40 a thin film transistor wherein said material is included in said semiconductor island at a concentration less than $5 \times 10^{19} \text{ cm}^{-3}$. It is not clear if Zhang¹ teaches that the material is included in the semiconductor at a concentration not higher than $5 \times 10^{19} \text{ cm}^{-3}$. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to

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use the material included in the semiconductor at a concentration not higher than $5 \times 10^{19} \text{ cm}^{-3}$ in the device of Zhang¹ because the current claimed range and the disclosed range in Zhang¹ overlap.

With regard to claim 96, Zhang¹ discloses in column 4, lines 18 – 20 wherein said semiconductor island is a silicon island.

With regard to claim 97, Zhang¹ discloses in column 9, lines 38 – 43 wherein the crystalline semiconductor island includes carbon and nitrogen at a concentration less than $1 \times 10^{18} \text{ cm}^{-3}$, and oxygen at a concentration less than $1 \times 10^{18} \text{ cm}^{-3}$. It is not clear if Zhang¹ teaches that said crystalline semiconductor island includes carbon and nitrogen at a concentration not lower than $1 \times 10^{16} \text{ cm}^{-3}$, and oxygen at a concentration not lower than $1 \times 10^{17} \text{ cm}^{-3}$. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use carbon and nitrogen at a concentration not lower than $1 \times 10^{16} \text{ cm}^{-3}$, and oxygen at a concentration not lower than $1 \times 10^{17} \text{ cm}^{-3}$ in the device of Zhang¹ because the current claimed range and the disclosed range in Zhang¹ overlap.

With regard to claim 98, Zhang¹ teaches in figures 1a, 1b, 2a – 2d; and column 12, lines 1 – 30 wherein said monodomain region has a grain size of $50 \mu\text{m}$ or more. It should be noted that the crystal grains (3) grown around metal portions (2) must have a grain size of $50 - 100 \mu\text{m}$ when the metal portions are set from $25 - 50 \mu\text{m}$ apart as disclosed by Zhang¹ in column 12, lines 1 – 30.

With regard to claim 99, Zhang¹ discloses in figure 4c semiconductor device. Zhang¹ discloses in column 9, lines 38 – 45 a p-channel thin film transistor. Zhang¹ discloses in column 9, lines 38 – 45 an n-channel thin film transistor. Zhang¹ discloses in figures 1a – 1c, 2a - 2d, and

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4a – 4c a crystalline semiconductor island on an insulating surface. Zhang¹ discloses in figures 4b and 4c source and drain regions in said semiconductor island. Zhang¹ discloses in figure 4b a channel forming region between said source and drain regions. Zhang¹ discloses in figures 1a-1c, 2a – 2d, and 4a – 4c a gate insulating film adjacent to at least said channel forming region. Zhang¹ discloses in figures 1a- 1c, 2a – 2d, and 4a – 4c a gate electrode adjacent to said channel forming region having said gate insulating film therebetween, wherein said crystalline semiconductor island is formed in a monodomain region which contains no grain boundary. Zhang¹ discloses in figures 4c and column 11, lines 47 – 56 wherein said crystalline semiconductor island includes hydrogen at concentration less than $1 \times 10^{20} \text{ cm}^{-3}$ (i.e. the known atomic density of Si is 10^{22} cm^{-3} , less than 5% of 10^{22} is less than 10^{20}). It is not clear if Zhang¹ teaches that the hydrogen concentration is not higher than $1 \times 10^{20} \text{ cm}^{-3}$. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use the hydrogen atom concentration of not higher than $1 \times 10^{20} \text{ cm}^{-3}$ in the device of Zhang¹ because the current claimed range and the disclosed range in Zhang¹ overlap. Further, any changes in particular device concentrations or properties would have been routine experimentation for one of ordinary skill seeking to maximize device function in the device of Zhang¹.

With regard to claim 100, Zhang¹ discloses in figures 1a, 1b, and 2a; and column 6, lines 19 – 40 wherein said crystalline semiconductor island comprises a material Ni.

With regard to claim 101, Zhang¹ discloses in figures 1a, 1b, and 2a; and column 6, lines 19 – 40 a thin film transistor wherein said material is included in said semiconductor island at a concentration less than $5 \times 10^{19} \text{ cm}^{-3}$. It is not clear if Zhang¹ teaches that the material is included

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in the semiconductor at a concentration not higher than $5 \times 10^{19} \text{ cm}^{-3}$. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use the material included in the semiconductor at a concentration not higher than $5 \times 10^{19} \text{ cm}^{-3}$ in the device of Zhang¹ because the current claimed range and the disclosed range in Zhang¹ overlap.

With regard to claim 102, Zhang¹ discloses in column 4, lines 18 – 20 wherein said semiconductor island is a silicon island.

With regard to claim 103, Zhang¹ discloses in column 9, lines 38 – 43 wherein the crystalline semiconductor island includes carbon and nitrogen at a concentration less than $1 \times 10^{18} \text{ cm}^{-3}$, and oxygen at a concentration less than $1 \times 10^{18} \text{ cm}^{-3}$. It is not clear if Zhang¹ teaches that said crystalline semiconductor island includes carbon and nitrogen at a concentration not lower than $1 \times 10^{16} \text{ cm}^{-3}$, and oxygen at a concentration not lower than $1 \times 10^{17} \text{ cm}^{-3}$. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use carbon and nitrogen at a concentration not lower than $1 \times 10^{16} \text{ cm}^{-3}$, and oxygen at a concentration not lower than $1 \times 10^{17} \text{ cm}^{-3}$ in the device of Zhang¹ because the current claimed range and the disclosed range in Zhang¹ overlap.

With regard to claim 104, Zhang¹ teaches in figures 1a, 1b, 2a – 2d; and column 12, lines 1 – 30 wherein said monodomain region has a grain size of $50 \text{ }\mu\text{m}$ or more. It should be noted that the crystal grains (3) grown around metal portions (2) must have a grain size of $50 - 100 \text{ }\mu\text{m}$ when the metal portions are set from $25 - 50 \text{ }\mu\text{m}$ apart as disclosed by Zhang¹ in column 12, lines 1 – 30.

With regard to claim 105, Zhang¹ discloses in figure 4c semiconductor device. Zhang¹ discloses in column 9, lines 38 – 45 a p-channel thin film transistor. Zhang¹ discloses in column 9, lines 38 – 45 an n-channel thin film transistor. Zhang¹ discloses in figures 1a – 1c, 2a - 2d, and 4a – 4c a crystalline semiconductor island on an insulating surface. Zhang¹ discloses in figures 4b and 4c source and drain regions in said semiconductor island. Zhang¹ discloses in figure 4b a channel forming region between said source and drain regions. Zhang¹ discloses in figures 1a- 1c, 2a – 2d, and 4a – 4c a gate insulating film adjacent to at least said channel forming region. Zhang¹ discloses in figures 1a- 1c, 2a – 2d, and 4a – 4c a gate electrode adjacent to said channel forming region having said gate insulating film therebetween, wherein said channel forming region is formed in a monodomain region which contains no grain boundary. Zhang¹ discloses in column 9, lines 38 – 43 wherein the crystalline semiconductor island includes carbon at a concentration less than $1 \times 10^{18} \text{ cm}^{-3}$. It is not clear if Zhang¹ teaches that said crystalline semiconductor island includes carbon at a concentration not higher than $5 \times 10^{18} \text{ cm}^{-3}$. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use carbon at a concentration not higher than $5 \times 10^{18} \text{ cm}^{-3}$ in the device of Zhang¹ because the current claimed range and the disclosed range in Zhang¹ overlap. Zhang¹ discloses in figures 4c and column 11, lines 47 – 56 wherein said crystalline semiconductor island includes hydrogen at concentration less than $1 \times 10^{20} \text{ cm}^{-3}$ (i.e. the known atomic density of Si is 10^{22} cm^{-3} , less than 5% of 10^{22} is less than 10^{20}). It is not clear if Zhang¹ teaches that the hydrogen concentration is not higher than $1 \times 10^{20} \text{ cm}^{-3}$. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use the hydrogen atom concentration of not higher than $1 \times 10^{20} \text{ cm}^{-3}$ in the device of

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Zhang¹ because the current claimed range and the disclosed range in Zhang¹ overlap. Further, any changes in particular device concentrations or properties would have been routine experimentation for one of ordinary skill seeking to maximize device function in the device of Zhang¹.

With regard to claim 106, Zhang¹ discloses in figures 1a, 1b, and 2a; and column 6, lines 19 – 40 wherein said crystalline semiconductor island comprises a material Ni.

With regard to claim 107, Zhang¹ discloses in figures 1a, 1b, and 2a; and column 6, lines 19 – 40 a thin film transistor wherein said material is included in said semiconductor island at a concentration less than $5 \times 10^{19} \text{ cm}^{-3}$. It is not clear if Zhang¹ teaches that the material is included in the semiconductor at a concentration not higher than $5 \times 10^{19} \text{ cm}^{-3}$. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use the material included in the semiconductor at a concentration not higher than $5 \times 10^{19} \text{ cm}^{-3}$ in the device of Zhang¹ because the current claimed range and the disclosed range in Zhang¹ overlap.

With regard to claim 108, Zhang¹ discloses in column 4, lines 18 – 20 wherein said semiconductor island is a silicon island.

With regard to claim 109, Zhang¹ discloses in column 9, lines 38 – 43 wherein the crystalline semiconductor island includes carbon and nitrogen at a concentration less than $1 \times 10^{18} \text{ cm}^{-3}$, and oxygen at a concentration less than $1 \times 10^{18} \text{ cm}^{-3}$. It is not clear if Zhang¹ teaches that said crystalline semiconductor island includes carbon and nitrogen at a concentration not lower than $1 \times 10^{16} \text{ cm}^{-3}$, and oxygen at a concentration not lower than $1 \times 10^{17} \text{ cm}^{-3}$. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of

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ordinary skill in the art to use carbon and nitrogen at a concentration not lower than $1 \times 10^{16} \text{ cm}^{-3}$, and oxygen at a concentration not lower than $1 \times 10^{17} \text{ cm}^{-3}$ in the device of Zhang¹ because the current claimed range and the disclosed range in Zhang¹ overlap.

With regard to claim 110, Zhang¹ teaches in figures 1a, 1b, 2a – 2d; and column 12, lines 1 – 30 wherein said monodomain region has a grain size of 50 μm or more. It should be noted that the crystal grains (3) grown around metal portions (2) must have a grain size of 50 – 100 μm when the metal portions are set from 25 – 50 μm apart as disclosed by Zhang¹ in column 12, lines 1 – 30.

With regard to claim 111, Zhang¹ discloses in figure 4c semiconductor device. Zhang¹ discloses in figures 8a and 8b; and column 9, lines 28 - 37 an active matrix circuit portion including at least a first thin film transistor. Zhang¹ discloses in column 9, lines 38 – 45 a driving circuit portion including at least a second thin film transistor. Zhang¹ discloses in figures 1a – 1c, 2a - 2d, and 4a – 4c a crystalline semiconductor island on an insulating surface. Zhang¹ discloses in figures 4b and 4c source and drain regions in said semiconductor island. Zhang¹ discloses in figure 4b a channel forming region between said source and drain regions. Zhang¹ discloses in figures 1a- 1c, 2a – 2d, and 4a – 4c a gate insulating film adjacent to at least said channel forming region. Zhang¹ discloses in figures 1a- 1c, 2a – 2d, and 4a – 4c a gate electrode adjacent to said channel forming region having said gate insulating film therebetween, wherein said crystalline semiconductor island is formed in a monodomain region which contains no grain boundary. Zhang¹ discloses in figures 4c and column 11, lines 47 – 56 wherein said crystalline semiconductor island includes hydrogen at concentration less than $1 \times 10^{20} \text{ cm}^{-3}$ (i.e. the known atomic density of Si is 10^{22} cm^{-3} , less than 5% of 10^{22} is less than 10^{20}). It is not clear if Zhang¹

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teaches that the hydrogen concentration is not higher than $1 \times 10^{20} \text{ cm}^{-3}$. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use the hydrogen atom concentration of not higher than $1 \times 10^{20} \text{ cm}^{-3}$ in the device of Zhang¹ because the current claimed range and the disclosed range in Zhang¹ overlap. Further, any changes in particular device concentrations or properties would have been routine experimentation for one of ordinary skill seeking to maximize device function in the device of Zhang¹.

With regard to claim 112, Zhang¹ discloses in figures 1a, 1b, and 2a; and column 6, lines 19 – 40 wherein said crystalline semiconductor island comprises a material Ni.

With regard to claim 113, Zhang¹ discloses in figures 1a, 1b, and 2a; and column 6, lines 19 – 40 a thin film transistor wherein said material is included in said semiconductor island at a concentration less than $5 \times 10^{19} \text{ cm}^{-3}$. It is not clear if Zhang¹ teaches that the material is included in the semiconductor at a concentration not higher than $5 \times 10^{19} \text{ cm}^{-3}$. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use the material included in the semiconductor at a concentration not higher than $5 \times 10^{19} \text{ cm}^{-3}$ in the device of Zhang¹ because the current claimed range and the disclosed range in Zhang¹ overlap.

With regard to claim 114, Zhang¹ discloses in column 4, lines 18 – 20 wherein said semiconductor island is a silicon island.

With regard to claim 115, Zhang¹ discloses in column 9, lines 38 – 43 wherein the crystalline semiconductor island includes carbon and nitrogen at a concentration less than $1 \times 10^{18} \text{ cm}^{-3}$, and oxygen at a concentration less than $1 \times 10^{18} \text{ cm}^{-3}$. It is not clear if Zhang¹ teaches

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that said crystalline semiconductor island includes carbon and nitrogen at a concentration not lower than $1 \times 10^{16} \text{ cm}^{-3}$, and oxygen at a concentration not lower than $1 \times 10^{17} \text{ cm}^{-3}$. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use carbon and nitrogen at a concentration not lower than $1 \times 10^{16} \text{ cm}^{-3}$, and oxygen at a concentration not lower than $1 \times 10^{17} \text{ cm}^{-3}$ in the device of Zhang¹ because the current claimed range and the disclosed range in Zhang¹ overlap.

With regard to claim 116, Zhang¹ teaches in figures 1a, 1b, 2a – 2d; and column 12, lines 1 – 30 wherein said monodomain region has a grain size of 50 μm or more. It should be noted that the crystal grains (3) grown around metal portions (2) must have a grain size of 50 – 100 μm when the metal portions are set from 25 – 50 μm apart as disclosed by Zhang¹ in column 12, lines 1 – 30.

With regard to claim 119, Zhang¹ discloses in figures 1a, 1b, and 2a; and column 6, lines 19 – 40 a thin film transistor wherein said material is included in said semiconductor island at a concentration less than $5 \times 10^{19} \text{ cm}^{-3}$. It is not clear if Zhang¹ teaches that the material is included in the semiconductor at a concentration not greater than $5 \times 10^{19} \text{ cm}^{-3}$. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use the material included in the semiconductor at a concentration not greater than $5 \times 10^{19} \text{ cm}^{-3}$ in the device of Zhang¹ because the current claimed range and the disclosed range in Zhang¹ overlap.

With regard to claim 123, Zhang¹ discloses in figure 4c a semiconductor device. Zhang¹ discloses in figures 1a – 1c, 2a – 2d, and 4a – 4c a crystalline semiconductor island on an insulating surface. Zhang¹ discloses in figures 4b and 4c source and drain regions in said

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semiconductor island. Zhang¹ discloses in figure 4b a channel forming region between said source and drain regions. Zhang¹ discloses in figures 1a- 1c, 2a – 2d, and 4a – 4c a gate insulating film adjacent to at least said channel forming region. Zhang¹ discloses in figures 1a- 1c, 2a – 2d, and 4a – 4c a gate electrode adjacent to said channel forming region having said gate insulating film therebetween, wherein said crystalline semiconductor island is formed in a monodomain region which contains no grain boundary. Zhang¹ discloses in column 9, lines 38 – 43 wherein the crystalline semiconductor island includes carbon and nitrogen at a concentration less than $1 \times 10^{18} \text{ cm}^{-3}$. It is not clear if Zhang¹ teaches that said crystalline semiconductor island includes carbon and nitrogen at a concentration not higher than $5 \times 10^{18} \text{ cm}^{-3}$. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use carbon and nitrogen at a concentration not higher than $5 \times 10^{18} \text{ cm}^{-3}$ in the device of Zhang¹ because the current claimed range and the disclosed range in Zhang¹ overlap. No differences have been pointed out in the formation of the channel forming region of Zhang¹ and the channel forming region of the current pending claim in view of the currently pending specification. Therefore Zhang¹ must teach in figures 1a – 1c, 2a – 2d and 4a – 4c wherein said semiconductor device has a S value of 0.03-0.3, because an identical S value is a property that must be shared by products that result from two processes that are the same. Zhang¹ discloses in figures 4c and column 11, lines 47 – 56 wherein said crystalline semiconductor island includes hydrogen at concentration less than $1 \times 10^{20} \text{ cm}^{-3}$ (i.e. the known atomic density of Si is 10^{22} cm^{-3} , less than 5% of 10^{22} is less than 10^{20}). It is not clear if Zhang¹ teaches that the hydrogen concentration is not higher than $1 \times 10^{20} \text{ cm}^{-3}$. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use the hydrogen atom

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concentration of not higher than $1 \times 10^{20} \text{ cm}^{-3}$ in the device of Zhang¹ because the current claimed range and the disclosed range in Zhang¹ overlap. Zhang¹ discloses in column 9, lines 38 – 45 wherein the semiconductor device includes at least one selected from the group consisting of a p-channel thin film transistor and an n-channel thin film transistor. Zhang¹ discloses in column 9, lines 38 – 45 wherein the semiconductor device includes a p-channel thin film transistor having a mobility in a range of $20 - 100 \text{ cm}^2/\text{Vs}$. Zhang¹ is silent to the fact that the semiconductor device includes a p-channel thin film transistor having mobility in a range of $200 - 400 \text{ cm}^2/\text{Vs}$. Mobility is a function of the purity of the single crystal (monodomain) semiconductor. MPEP section 2144.04, VII teaches that it is obvious to one of ordinary skill in the art to have a more purely defect free p-channel monodomain region with mobility in a range of $200 - 400 \text{ cm}^2/\text{Vs}$ in the device of Zhang¹. This is because the prior art teaches a suitable method for obtaining the claimed mobility, and that fact that the monodomain region of Zhang¹ has the same utility as that of the claimed invention. Zhang¹ discloses in column 9, lines 38 – 45 wherein the semiconductor device includes an n-channel thin film transistor having a mobility in a range of $30 - 150 \text{ cm}^2/\text{Vs}$. Zhang¹ is silent to the fact that the semiconductor device includes an n-channel thin film transistor having mobility in a range of $500 - 1000 \text{ cm}^2/\text{Vs}$. Mobility is a function of the purity of the single crystal (monodomain) semiconductor. MPEP section 2144.04, VII teaches that it is obvious to one of ordinary skill in the art to have a more purely defect free n-channel monodomain region with mobility in a range of $500 - 1000 \text{ cm}^2/\text{Vs}$ in the device of Zhang¹. This is because the prior art teaches a suitable method for obtaining the claimed mobility, and that fact that the monodomain region of Zhang¹ has the same utility as that of the claimed invention. Further, any changes in particular device concentrations or properties would

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have been routine experimentation for one of ordinary skill seeking to maximize device function in the device of Zhang¹.

With regard to claim 124, Zhang¹ discloses in figures 1a, 1b, and 2a; and column 6, lines 19 – 40 wherein said crystalline semiconductor island comprises a material Ni.

With regard to claim 125, Zhang¹ discloses in figures 1a, 1b, and 2a; and column 6, lines 19 – 40 a thin film transistor wherein said material is included in said semiconductor island at a concentration less than $5 \times 10^{19} \text{ cm}^{-3}$. It is not clear if Zhang¹ teaches that the material is included in the semiconductor at a concentration not higher than $5 \times 10^{19} \text{ cm}^{-3}$. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use the material included in the semiconductor at a concentration not higher than $5 \times 10^{19} \text{ cm}^{-3}$ in the device of Zhang¹ because the current claimed range and the disclosed range in Zhang¹ overlap.

With regard to claim 126, Zhang¹ discloses in column 4, lines 18 – 20 wherein said semiconductor island is a silicon island.

With regard to claim 127, Zhang¹ discloses in column 9, lines 38 – 43 wherein the crystalline semiconductor island includes carbon and nitrogen at a concentration less than $1 \times 10^{18} \text{ cm}^{-3}$, and oxygen at a concentration less than $1 \times 10^{18} \text{ cm}^{-3}$. It is not clear if Zhang¹ teaches that said crystalline semiconductor island includes carbon and nitrogen at a concentration not lower than $1 \times 10^{16} \text{ cm}^{-3}$, and oxygen at a concentration not lower than $1 \times 10^{17} \text{ cm}^{-3}$. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use carbon and nitrogen at a concentration not lower than $1 \times 10^{16} \text{ cm}^{-3}$

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³, and oxygen at a concentration not lower than $1 \times 10^{17} \text{ cm}^{-3}$ in the device of Zhang¹ because the current claimed range and the disclosed range in Zhang¹ overlap.

With regard to claim 128, Zhang¹ teaches in figures 1a, 1b, 2a – 2d; and column 12, lines 1 – 30 wherein said monodomain region has a grain size of 50 μm or more. It should be noted that the crystal grains (3) grown around metal portions (2) must have a grain size of 50 – 100 μm when the metal portions are set from 25 – 50 μm apart as disclosed by Zhang¹ in column 12, lines 1 – 30.

With regard to claim 129, Zhang¹ discloses in figure 4c semiconductor device. Zhang¹ discloses in figures 1a – 1c, 2a – 2d, and 4a – 4c a crystalline semiconductor island on an insulating surface. Zhang¹ discloses in figures 4b and 4c source and drain regions in said semiconductor island. Zhang¹ discloses in figure 4b a channel forming region between said source and drain regions. Zhang¹ discloses in figures 1a- 1c, 2a – 2d, and 4a – 4c a gate insulating film adjacent to at least said channel forming region. Zhang¹ discloses in figures 1a- 1c, 2a – 2d, and 4a – 4c a gate electrode adjacent to said channel forming region having said gate insulating film therebetween, wherein said crystalline semiconductor island includes carbon and nitrogen at a concentration not higher than $5 \times 10^{18} \text{ cm}^{-3}$, wherein said channel forming region is formed in a monodomain region which contains no grain boundary. No differences have been pointed out in the formation of the channel forming region of Zhang¹ and the channel forming region of the current pending claim in view of the currently pending specification. Therefore Zhang¹ must teach in figures 1a – 1c, 2a – 2d and 4a – 4c wherein said semiconductor device has a S value of 0.03-0.3, because an identical S value is a property that must be shared by products that result from two processes that are the same. Zhang¹ discloses in figures 4c and column 11,

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lines 47 – 56 wherein said crystalline semiconductor island includes hydrogen at concentration less than $1 \times 10^{20} \text{ cm}^{-3}$ (i.e. the known atomic density of Si is 10^{22} cm^{-3} , less than 5% of 10^{22} is less than 10^{20}). It is not clear if Zhang¹ teaches that the hydrogen concentration is not higher than $1 \times 10^{20} \text{ cm}^{-3}$. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use the hydrogen atom concentration of not higher than $1 \times 10^{20} \text{ cm}^{-3}$ in the device of Zhang¹ because the current claimed range and the disclosed range in Zhang¹ overlap. Zhang¹ discloses in column 9, lines 38 – 45 wherein the semiconductor device includes at least one selected from the group consisting of a p-channel thin film transistor and an n-channel thin film transistor. Zhang¹ discloses in column 9, lines 38 – 45 wherein the semiconductor device includes a p-channel thin film transistor having a mobility in a range of 20 – 100 cm^2/Vs . Zhang¹ is silent to the fact that the semiconductor device includes a p-channel thin film transistor having mobility in a range of 200-400 cm^2/Vs . Mobility is a function of the purity of the single crystal (monodomain) semiconductor. MPEP section 2144.04, VII teaches that it is obvious to one of ordinary skill in the art to have a more purely defect free p-channel monodomain region with mobility in a range of 200-400 cm^2/Vs in the device of Zhang¹. This is because the prior art teaches a suitable method for obtaining the claimed mobility, and that fact that the monodomain region of Zhang¹ has the same utility as that of the claimed invention. Zhang¹ discloses in column 9, lines 38 – 45 wherein the semiconductor device includes an n-channel thin film transistor having a mobility in a range of 30 – 150 cm^2/Vs . Zhang¹ is silent to the fact that the semiconductor device includes an n-channel thin film transistor having mobility in a range of 500-1000 cm^2/Vs . Mobility is a function of the purity of the single crystal (monodomain) semiconductor. MPEP section 2144.04, VII teaches that it is obvious to one of

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ordinary skill in the art to have a more purely defect free n-channel monodomain region with mobility in a range of 500-1000 cm^2/Vs in the device of Zhang¹. This is because the prior art teaches a suitable method for obtaining the claimed mobility, and that fact that the monodomain region of Zhang¹ has the same utility as that of the claimed invention. Further, any changes in particular device concentrations or properties would have been routine experimentation for one of ordinary skill seeking to maximize device function in the device of Zhang¹.

With regard to claim 130, Zhang¹ discloses in figures 1a, 1b, and 2a; and column 6, lines 19 – 40 wherein said crystalline semiconductor island comprises a material Ni.

With regard to claim 131, Zhang¹ discloses in figures 1a, 1b, and 2a; and column 6, lines 19 – 40 a thin film transistor wherein said material is included in said semiconductor island at a concentration less than $5 \times 10^{19} \text{ cm}^{-3}$. It is not clear if Zhang¹ teaches that the material is included in the semiconductor at a concentration not higher than $5 \times 10^{19} \text{ cm}^{-3}$. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use the material included in the semiconductor at a concentration not higher than $5 \times 10^{19} \text{ cm}^{-3}$ in the device of Zhang¹ because the current claimed range and the disclosed range in Zhang¹ overlap.

With regard to claim 132, Zhang¹ discloses in column 4, lines 18 – 20 wherein said semiconductor island is a silicon island.

With regard to claim 133, Zhang¹ discloses in column 9, lines 38 – 43 wherein the crystalline semiconductor island includes carbon and nitrogen at a concentration less than $1 \times 10^{18} \text{ cm}^{-3}$, and oxygen at a concentration less than $1 \times 10^{18} \text{ cm}^{-3}$. It is not clear if Zhang¹ teaches that said crystalline semiconductor island includes carbon and nitrogen at a concentration not

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lower than $1 \times 10^{16} \text{ cm}^{-3}$, and oxygen at a concentration not lower than $1 \times 10^{17} \text{ cm}^{-3}$. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use carbon and nitrogen at a concentration not lower than $1 \times 10^{16} \text{ cm}^{-3}$, and oxygen at a concentration not lower than $1 \times 10^{17} \text{ cm}^{-3}$ in the device of Zhang¹ because the current claimed range and the disclosed range in Zhang¹ overlap.

With regard to claim 134, Zhang¹ teaches in figures 1a, 1b, 2a – 2d; and column 12, lines 1 – 30 wherein said monodomain region has a grain size of 50 μm or more. It should be noted that the crystal grains (3) grown around metal portions (2) must have a grain size of 50 – 100 μm when the metal portions are set from 25 – 50 μm apart as disclosed by Zhang¹ in column 12, lines 1 – 30.

With regard to claim 135, Zhang¹ discloses in column 9, lines 38 – 45 wherein each of the concentrations of carbon, nitrogen and oxygen is measured. A method of measuring does not define a patentable feature in a device claim. Therefore, measuring the concentration of carbon, nitrogen and oxygen by the well known technique of secondary ion mass spectroscopy (SIMS) does not bear any patentable weight in this device claim. Further, it would have been obvious to one of ordinary skill in the art at the time of the present invention to use the technique of SIMS to measure the concentration of carbon, nitrogen and oxygen in the device of Zhang¹ in order to understand the electrical characteristics of the device as it relates to these features. This understanding would result in better device control.

With regard to claim 136, Zhang¹ discloses in column 9, lines 38 – 45 wherein each of the concentrations of carbon, nitrogen and oxygen is measured. A method of measuring does not define a patentable feature in a device claim. Therefore, measuring the concentration of

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carbon, nitrogen and oxygen by the well known technique of secondary ion mass spectroscopy (SIMS) does not bear any patentable weight in this device claim. Further, it would have been obvious to one of ordinary skill in the art at the time of the present invention to use the technique of SIMS to measure the concentration of carbon, nitrogen and oxygen in the device of Zhang¹ in order to understand the electrical characteristics of the device as it relates to these features. This understanding would result in better device control.

With regard to claim 137, Zhang¹ discloses in column 9, lines 38 – 45 wherein each of the concentrations of carbon, nitrogen and oxygen is measured. A method of measuring does not define a patentable feature in a device claim. Therefore, measuring the concentration of carbon, nitrogen and oxygen by the well known technique of secondary ion mass spectroscopy (SIMS) does not bear any patentable weight in this device claim. Further, it would have been obvious to one of ordinary skill in the art at the time of the present invention to use the technique of SIMS to measure the concentration of carbon, nitrogen and oxygen in the device of Zhang¹ in order to understand the electrical characteristics of the device as it relates to these features. This understanding would result in better device control.

With regard to claim 138, Zhang¹ discloses in column 9, lines 38 – 45 wherein each of the concentrations of carbon, nitrogen and oxygen is measured. A method of measuring does not define a patentable feature in a device claim. Therefore, measuring the concentration of carbon, nitrogen and oxygen by the well known technique of secondary ion mass spectroscopy (SIMS) does not bear any patentable weight in this device claim. Further, it would have been obvious to one of ordinary skill in the art at the time of the present invention to use the technique of SIMS to measure the concentration of carbon, nitrogen and oxygen in the device of Zhang¹ in order to

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understand the electrical characteristics of the device as it relates to these features. This understanding would result in better device control.

With regard to claim 139, Zhang¹ discloses in column 9, lines 38 – 45 wherein each of the concentrations of carbon, nitrogen and oxygen is measured. A method of measuring does not define a patentable feature in a device claim. Therefore, measuring the concentration of carbon, nitrogen and oxygen by the well known technique of secondary ion mass spectroscopy (SIMS) does not bear any patentable weight in this device claim. Further, it would have been obvious to one of ordinary skill in the art at the time of the present invention to use the technique of SIMS to measure the concentration of carbon, nitrogen and oxygen in the device of Zhang¹ in order to understand the electrical characteristics of the device as it relates to these features. This understanding would result in better device control.

With regard to claim 140, Zhang¹ discloses in column 9, lines 38 – 45 wherein each of the concentrations of carbon, nitrogen and oxygen is measured. A method of measuring does not define a patentable feature in a device claim. Therefore, measuring the concentration of carbon, nitrogen and oxygen by the well known technique of secondary ion mass spectroscopy (SIMS) does not bear any patentable weight in this device claim. Further, it would have been obvious to one of ordinary skill in the art at the time of the present invention to use the technique of SIMS to measure the concentration of carbon, nitrogen and oxygen in the device of Zhang¹ in order to understand the electrical characteristics of the device as it relates to these features. This understanding would result in better device control.

With regard to claim 141, Zhang¹ discloses in column 9, lines 38 – 45 wherein each of the concentrations of carbon, nitrogen and oxygen is measured. A method of measuring does not

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define a patentable feature in a device claim. Therefore, measuring the concentration of carbon, nitrogen and oxygen by the well known technique of secondary ion mass spectroscopy (SIMS) does not bear any patentable weight in this device claim. Further, it would have been obvious to one of ordinary skill in the art at the time of the present invention to use the technique of SIMS to measure the concentration of carbon, nitrogen and oxygen in the device of Zhang¹ in order to understand the electrical characteristics of the device as it relates to these features. This understanding would result in better device control.

With regard to claim 142, Zhang¹ discloses in column 9, lines 38 – 45 wherein each of the concentrations of carbon, nitrogen and oxygen is measured. A method of measuring does not define a patentable feature in a device claim. Therefore, measuring the concentration of carbon, nitrogen and oxygen by the well known technique of secondary ion mass spectroscopy (SIMS) does not bear any patentable weight in this device claim. Further, it would have been obvious to one of ordinary skill in the art at the time of the present invention to use the technique of SIMS to measure the concentration of carbon, nitrogen and oxygen in the device of Zhang¹ in order to understand the electrical characteristics of the device as it relates to these features. This understanding would result in better device control.

With regard to claim 143, Zhang¹ discloses in column 9, lines 38 – 45 wherein each of the concentrations of carbon, nitrogen and oxygen is measured. A method of measuring does not define a patentable feature in a device claim. Therefore, measuring the concentration of carbon, nitrogen and oxygen by the well known technique of secondary ion mass spectroscopy (SIMS) does not bear any patentable weight in this device claim. Further, it would have been obvious to one of ordinary skill in the art at the time of the present invention to use the technique of SIMS

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to measure the concentration of carbon, nitrogen and oxygen in the device of Zhang¹ in order to understand the electrical characteristics of the device as it relates to these features. This understanding would result in better device control.

With regard to claim 144, Zhang¹ discloses in column 9, lines 38 – 45 wherein each of the concentrations of carbon, nitrogen and oxygen is measured. A method of measuring does not define a patentable feature in a device claim. Therefore, measuring the concentration of carbon, nitrogen and oxygen by the well known technique of secondary ion mass spectroscopy (SIMS) does not bear any patentable weight in this device claim. Further, it would have been obvious to one of ordinary skill in the art at the time of the present invention to use the technique of SIMS to measure the concentration of carbon, nitrogen and oxygen in the device of Zhang¹ in order to understand the electrical characteristics of the device as it relates to these features. This understanding would result in better device control.

With regard to claim 145, Zhang¹ discloses in column 9, lines 38 – 43 wherein the crystalline semiconductor island includes carbon and nitrogen at a concentration less than $1 \times 10^{18} \text{ cm}^{-3}$, and oxygen at a concentration less than $1 \times 10^{18} \text{ cm}^{-3}$. It is not clear if Zhang¹ teaches that said crystalline semiconductor island includes carbon and nitrogen at a concentration not higher than $5 \times 10^{18} \text{ cm}^{-3}$, and oxygen at a concentration not higher than $5 \times 10^{19} \text{ cm}^{-3}$. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use carbon and nitrogen at a concentration not higher than $5 \times 10^{18} \text{ cm}^{-3}$, and oxygen at a concentration not higher than $5 \times 10^{19} \text{ cm}^{-3}$ in the device of Zhang¹ because the current claimed range and the disclosed range in Zhang¹ overlap.

With regard to claim 146, Zhang¹ discloses in column 9, lines 38 – 45 wherein the thin film transistor is an n-channel thin film transistor having a mobility in a range of 30 – 150 cm²/Vs. Zhang¹ is silent to the fact that the semiconductor device includes an n-channel thin film transistor having mobility in a range of 500-1000 cm²/Vs. Mobility is a function of the purity of the single crystal (monodomain) semiconductor. MPEP section 2144.04, VII teaches that it is obvious to one of ordinary skill in the art to have a more purely defect free n-channel monodomain region with mobility in a range of 500-1000 cm²/Vs in the device of Zhang¹. This is because the prior art teaches a suitable method for obtaining the claimed mobility, and that fact that the monodomain region of Zhang¹ has the same utility as that of the claimed invention.

With regard to claim 147, Zhang¹ discloses in column 9, lines 38 – 43 wherein the crystalline semiconductor island includes carbon and nitrogen at a concentration less than $1 \times 10^{18} \text{ cm}^{-3}$, and oxygen at a concentration less than $1 \times 10^{18} \text{ cm}^{-3}$. It is not clear if Zhang¹ teaches that said crystalline semiconductor island includes carbon and nitrogen at a concentration not higher than $5 \times 10^{18} \text{ cm}^{-3}$, and oxygen at a concentration not higher than $5 \times 10^{19} \text{ cm}^{-3}$. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use carbon and nitrogen at a concentration not higher than $5 \times 10^{18} \text{ cm}^{-3}$, and oxygen at a concentration not higher than $5 \times 10^{19} \text{ cm}^{-3}$ in the device of Zhang¹ because the current claimed range and the disclosed range in Zhang¹ overlap.

With regard to claim 148, Zhang¹ discloses in column 9, lines 38 – 45 wherein the thin film transistor is one of a p-channel thin film transistor having a mobility in a range of 20 – 100 cm²/Vs. Zhang¹ is silent to the fact that the semiconductor device includes a p-channel thin film transistor having mobility in a range of 200-400 cm²/Vs. Mobility is a function of the purity of

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the single crystal (monodomain) semiconductor. MPEP section 2144.04, VII teaches that it is obvious to one of ordinary skill in the art to have a more purely defect free p-channel monodomain region with mobility in a range of 200-400 cm²/Vs in the device of Zhang¹. This is because the prior art teaches a suitable method for obtaining the claimed mobility, and that fact that the monodomain region of Zhang¹ has the same utility as that of the claimed invention.

With regard to claim 149, Zhang¹ discloses in column 9, lines 38 – 43 wherein the crystalline semiconductor island includes carbon and nitrogen at a concentration less than $1 \times 10^{18} \text{ cm}^{-3}$, and oxygen at a concentration less than $1 \times 10^{18} \text{ cm}^{-3}$. It is not clear if Zhang¹ teaches that said crystalline semiconductor island includes carbon and nitrogen at a concentration not higher than $5 \times 10^{18} \text{ cm}^{-3}$, and oxygen at a concentration not higher than $5 \times 10^{19} \text{ cm}^{-3}$. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use carbon and nitrogen at a concentration not higher than $5 \times 10^{18} \text{ cm}^{-3}$, and oxygen at a concentration not higher than $5 \times 10^{19} \text{ cm}^{-3}$ in the device of Zhang¹ because the current claimed range and the disclosed range in Zhang¹ overlap.

With regard to claim 150, Zhang¹ discloses in column 9, lines 38 – 43 wherein the crystalline semiconductor island includes carbon and nitrogen at a concentration less than $1 \times 10^{18} \text{ cm}^{-3}$, and oxygen at a concentration less than $1 \times 10^{18} \text{ cm}^{-3}$. It is not clear if Zhang¹ teaches that said crystalline semiconductor island includes carbon and nitrogen at a concentration not higher than $5 \times 10^{18} \text{ cm}^{-3}$, and oxygen at a concentration not higher than $5 \times 10^{19} \text{ cm}^{-3}$. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use carbon and nitrogen at a concentration not higher than $5 \times 10^{18} \text{ cm}^{-3}$

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³, and oxygen at a concentration not higher than $5 \times 10^{19} \text{ cm}^{-3}$ in the device of Zhang¹ because the current claimed range and the disclosed range in Zhang¹ overlap.

With regard to claim 151, Zhang¹ discloses in column 9, lines 38 – 43 wherein the crystalline semiconductor island includes carbon and nitrogen at a concentration less than $1 \times 10^{18} \text{ cm}^{-3}$, and oxygen at a concentration less than $1 \times 10^{18} \text{ cm}^{-3}$. It is not clear if Zhang¹ teaches that said crystalline semiconductor island includes carbon and nitrogen at a concentration not higher than $5 \times 10^{18} \text{ cm}^{-3}$, and oxygen at a concentration not higher than $5 \times 10^{19} \text{ cm}^{-3}$. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use carbon and nitrogen at a concentration not higher than $5 \times 10^{18} \text{ cm}^{-3}$, and oxygen at a concentration not higher than $5 \times 10^{19} \text{ cm}^{-3}$ in the device of Zhang¹ because the current claimed range and the disclosed range in Zhang¹ overlap.

With regard to claim 152, Zhang¹ discloses in column 9, lines 38 – 45 wherein the semiconductor device includes a p-channel thin film transistor having a mobility in a range of 20 – 100 cm^2/Vs . Zhang¹ is silent to the fact that the semiconductor device includes a p-channel thin film transistor having mobility in a range of 200-400 cm^2/Vs . Mobility is a function of the purity of the single crystal (monodomain) semiconductor. MPEP section 2144.04, VII teaches that it is obvious to one of ordinary skill in the art to have a more purely defect free p-channel monodomain region with mobility in a range of 200-400 cm^2/Vs in the device of Zhang¹. This is because the prior art teaches a suitable method for obtaining the claimed mobility, and that fact that the monodomain region of Zhang¹ has the same utility as that of the claimed invention. Zhang¹ discloses in column 9, lines 38 – 45 wherein the semiconductor device includes a n-channel thin film transistor having a mobility in a range of 30 – 150 cm^2/Vs . Zhang¹ is silent to

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the fact that the semiconductor device includes an n-channel thin film transistor having mobility in a range of 500-1000 cm^2/Vs . Mobility is a function of the purity of the single crystal (monodomain) semiconductor. MPEP section 2144.04, VII teaches that it is obvious to one of ordinary skill in the art to have a more purely defect free n-channel monodomain region with mobility in a range of 500-1000 cm^2/Vs in the device of Zhang¹. This is because the prior art teaches a suitable method for obtaining the claimed mobility, and that fact that the monodomain region of Zhang¹ has the same utility as that of the claimed invention.

With regard to claim 153, Zhang¹ discloses in column 9, lines 38 – 45 wherein the semiconductor device includes a p-channel thin film transistor having a mobility in a range of 20 – 100 cm^2/Vs . Zhang¹ is silent to the fact that the semiconductor device includes a p-channel thin film transistor having mobility in a range of 200-400 cm^2/Vs . Mobility is a function of the purity of the single crystal (monodomain) semiconductor. MPEP section 2144.04, VII teaches that it is obvious to one of ordinary skill in the art to have a more purely defect free p-channel monodomain region with mobility in a range of 200-400 cm^2/Vs in the device of Zhang¹. This is because the prior art teaches a suitable method for obtaining the claimed mobility, and that fact that the monodomain region of Zhang¹ has the same utility as that of the claimed invention.

Zhang¹ discloses in column 9, lines 38 – 45 wherein the semiconductor device includes a n-channel thin film transistor having a mobility in a range of 30 – 150 cm^2/Vs . Zhang¹ is silent to the fact that the semiconductor device includes an n-channel thin film transistor having mobility in a range of 500-1000 cm^2/Vs . Mobility is a function of the purity of the single crystal (monodomain) semiconductor. MPEP section 2144.04, VII teaches that it is obvious to one of ordinary skill in the art to have a more purely defect free n-channel monodomain region with

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mobility in a range of $500\text{--}1000\text{ cm}^2/\text{Vs}$ in the device of Zhang¹. This is because the prior art teaches a suitable method for obtaining the claimed mobility, and that fact that the monodomain region of Zhang¹ has the same utility as that of the claimed invention.

With regard to claim 154, Zhang¹ discloses in column 9, lines 38 – 43 wherein the crystalline semiconductor island includes carbon and nitrogen at a concentration less than $1 \times 10^{18}\text{ cm}^{-3}$. It is not clear if Zhang¹ teaches that said crystalline semiconductor island includes carbon and nitrogen at a concentration not higher than $5 \times 10^{18}\text{ cm}^{-3}$. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use carbon and nitrogen at a concentration not higher than $5 \times 10^{18}\text{ cm}^{-3}$ in the device of Zhang¹ because the current claimed range and the disclosed range in Zhang¹ overlap.

With regard to claim 155, Zhang¹ discloses in column 9, lines 38 – 45 wherein the second thin film transistor is one of a p-channel thin film transistor having a mobility in a range of $20\text{--}100\text{ cm}^2/\text{Vs}$. Zhang¹ is silent to the fact that the semiconductor device includes a p-channel thin film transistor having mobility in a range of $200\text{--}400\text{ cm}^2/\text{Vs}$. Mobility is a function of the purity of the single crystal (monodomain) semiconductor. MPEP section 2144.04, VII teaches that it is obvious to one of ordinary skill in the art to have a more purely defect free p-channel monodomain region with mobility in a range of $200\text{--}400\text{ cm}^2/\text{Vs}$ in the device of Zhang¹. This is because the prior art teaches a suitable method for obtaining the claimed mobility, and that fact that the monodomain region of Zhang¹ has the same utility as that of the claimed invention.

Response to Arguments

5. Applicant's arguments filed May 5, 2002 have been fully considered but they are not persuasive.

6. With regard to applicant's argument that "None of the cited references specifically teach, disclose or suggest how to arrange or form a channel region in a portion of the film with no grain boundaries," it should be noted that Zhang¹ does in fact teach forming a channel region in a portion of a film with no grain boundaries. Zhang¹ teaches in figures 1a, 1b, and 2a – 2d forming a channel region in a portion of a film with no grain boundaries (4). Therefore, applicant's arguments are not persuasive, and the rejection is proper.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Paul E Brock II whose telephone number is (703)308-6236. The examiner can normally be reached on 8:30 AM-5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie Lee can be reached on (703)308-1690. The fax phone numbers for the organization where this application or proceeding is assigned are (703)308-7722 for regular communications and (703)308-7722 for After Final communications.

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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)308-0956.

Paul E Brock II
September 24, 2003

A handwritten signature in black ink, appearing to read "Paul E Brock II", written in a cursive style.